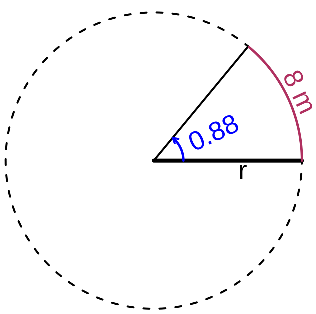
Name: Date:

Trig Final (Solution v28)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 0.88 radians. The arc length is 8 meters. How long is the radius in meters?

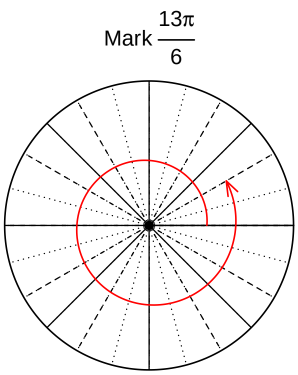


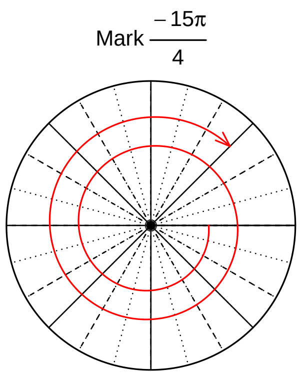
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 9.091$ meters.

Question 2

Consider angles $\frac{13\pi}{6}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{6}\right)$ and $\cos\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).





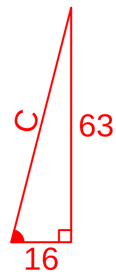
$\sin(13\pi/6) = \frac{1}{2}$

$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-63}{16}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

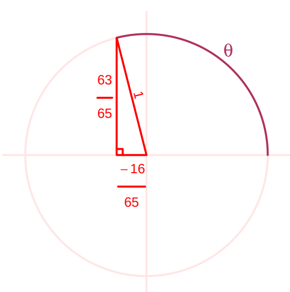
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + 63^2 = C^2$$
$$C = \sqrt{16^2 + 63^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{63}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.07 Hz, a midline at $y = 2.09$ meters, and an amplitude of 7.72 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -7.72 \sin(2\pi 6.07t) + 2.09$$

or

$$y = -7.72 \sin(12.14\pi t) + 2.09$$

or

$$y = -7.72 \sin(38.14t) + 2.09$$